EXPORTIT

OVERVIEW OF WORLD INFORMATION TECHNOLOGY AND INTERNET USAGE

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U.S. DEPARTMENT OF COMMERCE
International Trade Administration
Trade Development
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Office of Computers and Business Equipment

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Introduction

This paper provides overviews of investment and usage patterns in the information technology (IT) and Internet sectors in selected regions and countries around the world. Based on the analyses of socio-economic, IT usage, and telecommunications infrastructure data, observations are made concerning the economic effects of IT investment and the barriers to faster adoption of IT solutions in various countries. Tables containing this data are located in the appendix.

Historically, few industries have changed as rapidly in terms of technology and markets as the IT sector or been as far reaching, and because of this, current and exact information is difficult to collect. Statements, conclusions, and data presented in this report should be approached as snapshots in time of a highly dynamic environment. The latest information was used wherever possible, and in some cases data availability was limited. Data collection methodologies and times differ depending on the source of the information.

Information technology and the Internet have transformed the U.S. economy. Other countries are also beginning to harness new technologies to improve productivity and living standards. This paper seeks to review these developments and to assess the state of usage around the world.

Economic effects of IT investment

Most countries increasingly recognize the value of information technology investment in improving productivity, spurring economic growth, and creating jobs. Information technology enables task automation, the swift processing of data, and allows instantaneous information access. Businesses, governments, and other organizations can use IT to more efficiently accomplish core functions or to expand market opportunities.

Investing in information technologies creates employment. Expansion of IT usage often leads to growth in other economic segments, analogous to that of the automobile industry in the early twentieth century. Entirely new ancillary industries have sprung up around the application of IT, such as processing services; time-sharing facilities; technical training; database management; and electronic publishing. Not only do all of these areas create new, higher-paying jobs, but they also lead to a broadened commercial base and increased national wealth.

IT sector jobs often pay higher and offer greater benefits than employment in other sectors. In California's Silicon Valley over 50,000 new IT jobs were created during 1996 with higher incomes than the national industry averages.[1] Nationally, over 6 percent of the U.S. workforce in 1998 was in IT-related employment with an average income nearly double that of the norm.

The fastest growing segment of IT workers is in the software and services industries. Between 1985 and 1996, employment in these industries more than doubled from just over one-half million workers to 1.2 million with an average annual wage of about $56,000. By 2006, projections indicate the demand for these workers to double again to 2.5 million.[2] Other countries have also seen rapid gains. From 1993 to 1998, Canada and France had increases of 51,000 and 7,200 jobs, respectively.[3] Demand remains high. The Organization for Economic Cooperation and Development (OECD) estimates that there are 600,000 unfilled

[1] UNESCO
[2] U.S. Department of Commerce
[3] WITSA, "The Digital Planet"

software and services positions worldwide.[4]

Various studies have shown a correlation between investment in IT and increases in productivity and Gross Domestic Product (GDP), particularly in developed countries like the United States.

A **Department of Commerce** publication, *The Emerging Digital Economy*, revealed that investment in information technologies has grown from 3 percent of total business investment in the 1960s to 45 percent by 1996 in the United States, and that IT usage has driven more than a quarter of economic growth since 1993.

A recent working paper from the **Center for Research on Information Technology and Organizations** (CRITO) analyzed information technology investment data from the United States and 42 other countries over 11 years. The analysis showed a positive and significant relationship between growth in IT investment and growth in both GDP and labor productivity.

A report from **International Data Corporation** indicated that by 2003, every dollar of Internet investment in the U.S. will return a dollar fifty. This general conclusion was also reached by economists at MIT and the University of Pennsylvania's Wharton School, whose research found that each dollar invested in IT capital reaped far more in resultant revenue.

According to the **University of Texas**, investments in IT and e-commerce added nearly 400,000 Internet-related jobs to the U.S. economy in 1998, and the "Internet Economy" is projected to grow by $200 billion to $507 billion in 1999. Revenues derived from the Internet are growing faster than Internet-related employment, suggesting large productivity gains.

Source: Various

Numerous experts have echoed these findings. United States Federal Reserve chairman Alan Greenspan has credited information technology with significantly boosting productivity, thus taming inflation pressure: "The dramatic improvements in computing power and communication and information technology appear to have been a major force behind this beneficial trend."[5] Growth in IT has allowed the Fed to keep interest rates low and the U.S. economy growing.

A recent report by Princeton University economist Alan Blinder focused on the productivity gains made possible by computer interconnectivity. He found evidence pointing "to a speedup of productivity growth (and hence of sustainable GDP growth) in recent years, and it occurs at just about the time that access to the Internet was diffusing rapidly through the economy."[6]

"We're continuing to enjoy the thrust of computers and other information technologies. That is really the primary driver of productivity gains."[7]

Wells Fargo economist S.W. Sohn

Increased productivity from IT usage can be witnessed at the firm level. For instance, Cisco Systems, the U.S.-based computer network company, has experienced a 20 percent increase in the firm's productivity rate and saves $500 million a year in operating costs as a result of its IT usage. According to its chief executive, John Chambers, Cisco is "seeing … the tip of the iceberg in terms of technology-enabled savings and efficiencies."[8]

The IT industry itself has become a major driver of growth in countries and regions around the world, such as Ireland, Taiwan, and India's Bangalore region. In the United States, burgeoning local economies in the San Francisco Bay area, Boston, and Northern Virginia can be attributed to the success of their IT business communities. Other countries are beginning to catch on to the benefits of IT, and are attempting to emulate U.S. success with their own IT initiatives.

[4] WITSA, "The Digital Planet"
[5] Congressional testimony, 02/24/98
[6] Internet.com, 02/01/00
[7] Associated Press, 02/08/00
[8] Washington Post, 11/21/99

United Kingdom. The Department of Trade and Industry is planning to increase their "Innovation Budget" by more than 20 percent over three years, and will create a 150 million Enterprise Fund to support entrepreneurial start-up companies.

Malaysia. Kuala Lumpur is spending billions of dollars constructing from scratch their "Multimedia Super Corridor," which they are betting will become their equivalent of California's Silicon Valley.

China. Beijing's "Golden Projects" (Golden Bridge, Golden Card, Golden Customs, etc.) are a series of ambitious telecommunications and information infrastructure projects aimed at supporting the growth of the Chinese economy.

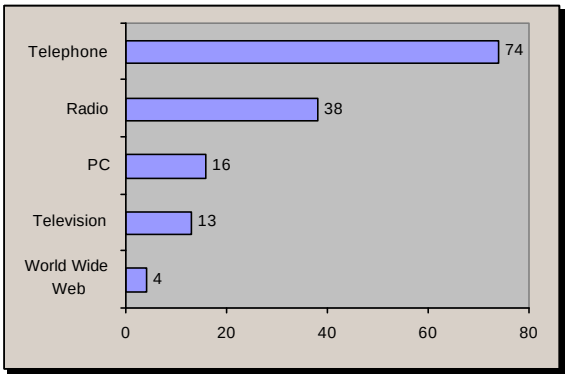
South Korea. The Ministry of Information and Communication plans to build a sophisticated electronic commerce system using post offices across the nation. The system will operate a large online shopping mall, offer a payment gateway system, and act as a certificate authority.

Source: Government web sites

The IT market sector now accounts for 15 to 25 percent of current real economic growth in the OECD economies.[9] Much of this has been driven by the growth in trade of IT products. Various estimates indicate that between 10 to 15 percent of world trade is in IT goods and services, and this trade is continuing to grow rapidly. The world market for computer hardware and software grew at about 15 percent annually in the 1990 – 1995 period, while in the same period the average growth rate for world trade was 8 percent. The value of total imports in the world trade of computer equipment grew by 67 percent from $87 billion in 1992 to $145 billion in 1996. The value of total exports grew by 75 percent from $73 billion in 1992 to $127 billion in 1996.[10]

Electronic commerce (e-commerce), defined by the OECD as commercial transactions that take place through open networks, is helping to propel the international sales growth of IT goods and services. E-commerce market activity worldwide was about $26 billion in 1998, with this figure expected to reach the trillion dollar mark in the early 21st century.[11] According to a study by HSBC Investment Banking PLC, the U.S. currently generates about 80 percent of world e-commerce, with Western Europe at 10 percent and Asia about 5 percent.[12]

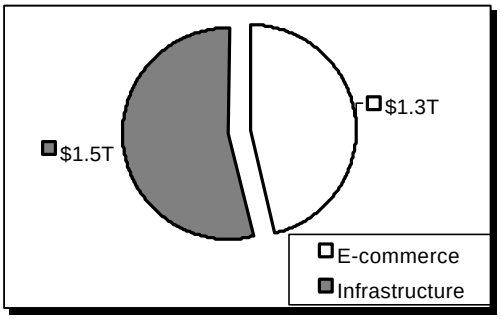
Years it took to reach 50 million users



Source: ITU

Even more will be spending will occur on the infrastructure needed to support e-commerce, as countries invest in new equipment and services. A recent study by Nortel Networks and IDC projects that Internet infrastructure spending will quadruple by 2003 to $1.5 trillion.[13]

Chart 1: Internet economy worldwide, 2003 (US$ trillions)



Source: Nortel Networks / IDC

Both businesses and consumers benefit from e-commerce through increased convenience, access, and lower costs via greater market efficiencies. As the business of cyberspace continues to grow and become an

[9] UNESCO
[10] Comtrade, UN statistics division
[11] UNESCO
[12] E-commerce Times, 02/02/00
[13] eMarketer, 02/04/00

increasingly important share of the overall world economy, expanding IT usage will become critical for the competitive health of national economies.

Effects of IT investment on developing countries

According to Nicholas Negroponte, founder of the MIT Media Lab, the next wave of e-commerce will hit the developing world -- particularly Africa and Latin America. According to Negroponte, the developing world will embrace IT and e-commerce as an alternative to existing economic channels and as a way to address inefficient distribution, educational, and communications infrastructures.[14]

Indeed, information technologies and the Internet can assist developing countries overcome certain constraints, notably in the areas of commerce, health, education, and agriculture.

> "…the small farming cooperative in an agricultural country, using information technologies to learn about new farming methods and obtain reports on product supply and demand, thereby increasing local exports severalfold and enabling entire villages to prosper…"
>
> National Research Council
> *Internet Counts: Measuring the Impacts of the Internet*

Source: International Telecommunications Union

Distance learning over the Internet can help supplement conventional schooling and bring educational resources to remote and rural areas. Doctors can use the Internet to access medical databases or exchange ideas with colleagues in other regions. Small businesses can use PCs and the Internet to find lower prices for inputs, develop a global customer base, and streamline their operations. Information technologies can help countries overcome resource limitations and gain access to information and contacts worldwide, allowing them to participate in the world economy and overcome traditional disadvantages such as distance from markets and inadequate physical infrastructure.

Health. In a rural area in Africa, a young man was brought to the hospital in a critical situation. Lab tests confirmed that his leg was infected with a flesh-eating bacteria, and amputation seemed the only possible way to save his life. However, after a quick consultation on MEDLINE – a free medical database on the Internet – the doctors were able to find an appropriate treatment. The young man was able to save both his life and his leg.

E-Business. Access to the Internet allowed a Malian perfume manufacturer to switch from French to more price-competitive U.S. suppliers. In Brazil, an online supermarket takes orders from expatriates for delivery of groceries to elderly relatives.

Education. In Zambia, mining companies suffered from a shortage of skilled technicians. To tackle the problem the Zambia National Correspondence College in cooperation with the Open University of Sri Lanka set up a computer center that, using distance education courses, was able to graduate in its first year of activities more than 180 students. Many of the graduates went on to contribute to the mining industry in Zambia.

Agriculture / Agribusiness. A small Peruvian village got connected to the Internet and established an online partnership with an international export company – soon their vegetables were shipped directly to the United States to be sold in New York. In Costa Rica, coffee producers promote and sell their coffee online.

Source: International Telecommunications Union

There are four major obstacles to IT and Internet usage growth in the developing world: costs; infrastructure; content; and regulations.

Getting online requires hardware and software, Internet access provision, and telephone service, all of which may be extremely expensive for the developing country user. For instance, many countries have prohibitively expensive local phone call access charges. In much of Latin America, high telephone rates were implemented to compensate for the cost of providing Internet service, yet at the same time they are hindering its growth.[15] (Refer to the tables in the appendix.)

[14] ZDNet, 03/25/99

[15] Excite News, 12/13/99

"A country's communications will determine how quickly the Internet takes off in that country."[16]

Microsoft Chairman Bill Gates

Inadequate basic infrastructure, such as insufficient telephone lines or reliable electrical power, is another barrier to expanding IT and Internet usage in developing countries. Many nations are attempting to deal with this problem through privatization, regulatory reform, and increased investment. However, in regions such as Africa there is still much work to be done. According to *African Business* magazine, half of the public schools in South Africa -- by far the wealthiest country on the continent -- lack electricity.

Kruger tells a story to illustrate the power of information management at grassroots level. He recalls sitting at a pavement café …[where] at an adjacent table a very well-dressed, obviously wealthy man was having his shoes signed by a [poor boy]. A cell phone rang. The call wasn't for the rich man. The shoeshine boy removed a handheld from his tattered jacket, spoke into it briefly and continued … shining his customer's shoes. A few minutes later, another [boy] appeared carrying a pair of shoes in need of a shine. When he was free, the [shoeshine boy] buffed up the footwear, gave them back to the courier who ran off to deliver them. He returned a little later with some coins which were split between cleaner and runner.

"I realized that I'd witnessed the basics of information management at work," relates Kruger. "Cell phones have become extremely cheap … the shoeshine boy had one and so did the runner. It was the runner's job to drum up business for the shoeshine boy who had the 'infrastructure' – the polish and the brushes – to do the work; the runner was paid for sales and distribution."[17]

Chairman of Espial Consulting Rudi Kruger
Johannesburg, South Africa
Excerpted from *African Business* magazine

The availability of content in the local language or dialect also affects the widespread diffusion of IT and Internet use. According to the Internet Society, more than 80 percent of web pages worldwide are in English although only 57 percent of Internet users are native English speakers.[18] Locally produced content is often unavailable due to a lack of education or awareness about the Internet, or lax legal protections for intellectual property. In many countries, high illiteracy levels or complex writing systems further impede usage of IT and the Internet.

Government policies and regulations also often hinder the growth of IT and the Internet. For example, in many developing countries Internet usage would increase given lower access costs, better quality of service, and a wider variety of available services. However, some countries have non-competitive Internet markets with complete or partial ISP monopolies. In these cases the PTO usually serves as the national service provider. Even in more competitive markets, the PTO often controls access to the international communications gateway (resulting in high international access costs for ISPs that are passed on to end users) or possesses an unfair advantage due to its control over the lines into homes and businesses.

To boost their competitiveness, an increasing number of local or regional ISPs are establishing partnerships with multinational service providers. For example, three U.S.-educated Kenyans started Africa Online, a pan-African service provider that is a subsidiary of U.S. ISP Prodigy.[19]

"I believe that half a loaf of bread is better than none. It is impossible to learn about computers without computers. But if you can afford a computer, no matter whether it was made in 1983 or 1995, you will be able to use it as a practice tool to help yourself."[20]

MIS Co. Ltd. Executive director E.J. Amana
Lagos, Nigeria

[16] E-commerce Times, 02/02/00
[17] African Business, 01/00
[18] ITU
[19] ITU
[20] African Business, July/August 1999

There are numerous governmental and non-governmental organizations with programs in place to help developing countries utilize IT for their economic development. Most are focusing their resources on education, health, or agriculture projects.

World Bank. The World Bank's infoDev has funded many projects throughout the developing world. They focus primarily on agriculture, health, and education, and seek innovative approaches to incorporating IT into the development process.

International Telecommunications Union. The ITU has two major initiatives dealing with the Internet and communications in the developing world: Electronic Commerce for Developing Countries and Telemedicine. Both are attempting to set up demonstration or pilot projects in order to foster related efforts.

United Nations. Various agencies of the United Nations are active in encouraging the use of IT as a tool for economic development. This includes the ITU, the United Nations Development Program (UNDP), the United Nations Educational, Scientific, and Cultural Organization (UNESCO), and the United Nations Conference on Trade and Development (UNCTAD). Most activities are centered on conferences and technical cooperation.

U.S. A.I.D. The United States Agency for International Development has a number of projects in the IT for development area. In sub-Saharan Africa, A.I.D. is continuing to implement the Leland Initiative, a 5-year, $15 million effort to connect countries to the Internet.

IT usage around the world

Information technology usage can be illustrated with three broad sets of indicators: basic; telecommunications infrastructure; and IT and Internet infrastructure. These indicators, although not comprehensive, provide a general overview of a country's level of IT integration and implementation. Basic and telecommunications indicators reveal the groundwork on which IT usage is based, while IT and Internet indicators are direct measures of usage. The two exceptions in the IT and Internet category are the indicators "IT spending as a percentage of GDP" and "ISPs," which are not usage measures but rather indicators of IT market and economic activity.

Basic Indicators
- Population
- Per capita GDP
- Literacy rates

Telecommunications Infrastructure Indicators
- Phone lines per 100 residents
- Phone line compound annual growth per 100 residents
- Largest city phone lines per 100 residents
- Cost of a one hour local call
- Phone line faults per 100 lines
- Cellular subscribers per 100 residents

IT and Internet Infrastructure Indicators
- Internet hosts per 10,000 residents / Total hosts
- Internet users per 100 residents / Total users
- PCs per 100 residents
- Total ISPs
- IT spending as a percentage of GDP

Indicators such as per capita GDP or IT spending are positively related to direct usage indicators like Internet user density. As per capita GDP or IT spending increases, Internet or PC usage rates increase (see section "Usage patterns" below). Other indicators, like population and literacy rates, are more germane for market development purposes or to examine issues of broader diffusion.

The tables in the appendix show indicator rankings for countries from four world regions along with a sampling of the developed world. The group of countries was selected based upon current and potential market size, general trade importance to the United States, and presence of U.S. Commerce Department offices. General receptivity to the English language, geographic proximity to other important markets, and level of current multilateral institution involvement are three useful factors that could also be examined in addition to quantitative indicators such as literacy rates and teledensity.

Selected countries

Africa	*Americas*	*Asia / Pacific*	*Eastern Europe*	*Developed*
Botswana	Argentina*	China*	Bulgaria*	Belgium*
Cote d'Ivoire*	Bolivia*	India*	Czech Republic*	Canada*
Ethiopia	Brazil*	Indonesia*	Hungary*	Denmark*
Ghana	Chile*	Korea*	Poland*	France*
Kenya*	Colombia*	Malaysia*	Russia*	Germany*
Mali	Costa Rica*	Philippines*		Ireland*
Mozambique	Ecuador*	Singapore*		Italy*
Namibia	Mexico*	Taiwan*		Japan*
Nigeria*	Paraguay	Thailand*		Netherlands*
Senegal	Peru*	Vietnam*		Spain*
South Africa*	Uruguay			UK*
Tanzania	Venezuela*			USA
Uganda				
Zambia				
Zimbabwe				

* Countries with U.S. Commerce Department offices

Basic indicators

Population, per capita GDP, and literacy rates are critical factors in the evaluation of IT markets. Larger countries with higher per capita GDPs are often more These countries have more developed business and physical infrastructures than smaller countries. Countries with higher incomes tend to have higher rates of IT and Internet usage, as seen in "Usage patterns" below.

Worldwide per capita GDP, 1997 (ppp by US$)

	Top Ten		Bottom Ten
1.	Luxembourg	1.	Congo, Dem. Rep.
2.	United States	2.	Rwanda
3.	Norway	3.	Ethiopia
4.	Monaco	4.	Sierra Leone
5.	Japan	5.	Chad (tie)
6.	United Arab Emirates	5.	Eritrea (tie)
7.	Switzerland	5.	Mali (tie)
8.	Belgium (tie)	5.	Somalia (tie)
8.	Denmark (tie)	9.	Burundi
10.	Liechtenstein	10.	Niger

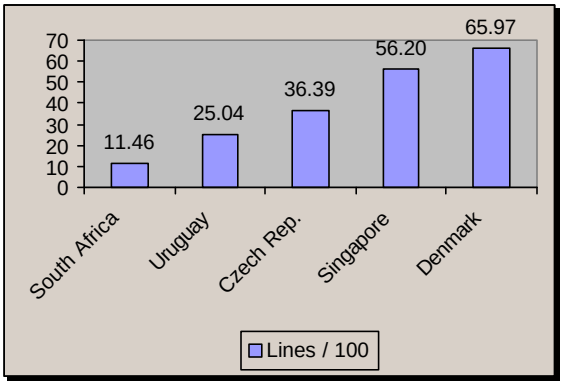
Note: Data from all countries
Source: CIA World Factbook, 1998

Literacy rates are an important indicator of a country's basic educational level and ability to use IT more broadly. Countries with high illiteracy levels may require a different set of IT products and services than developed nations. Alternatives like video-based kiosks or voice-based systems using cell phones may be more appropriate and are often finding greater mass acceptance. For instance, in India British firm WorldTel is investing US$1 billion in a joint venture with seven state governments to set up and run Internet kiosks in hospitals, banks, and government offices.[21] For the purposes of this study, male literacy rates were used.

Telecommunications infrastructure

A country's level of telecommunications infrastructure is vitally important in determining Internet and e-commerce readiness. The number of phone lines per 100 residents (teledensity) throughout the country and in the largest city indicates the level of access to telecommunications services along with the overall diffusion of this access. Teledensity for the largest city in each country is used because it is usually much higher than for remote or rural areas, especially in the developing world. The compound annual growth rate of telephone main lines is given to provide an indication of the level of investment in the telecommunications infrastructure. This may alter a country's attractiveness to foreign investment in the longer-term.

Chart 2: Top teledensities per region, 1998



Note: Data from selected pool of countries
Source: ITU

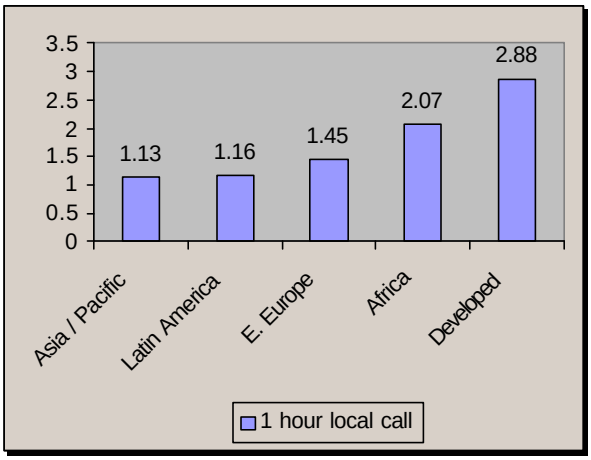
The cost of a one-hour local phone call is critically important in determining Internet

[21] Asia.internet.com, 01/04/00

accessibility. High prices, relative to per capita GDP, often make dialup Internet access prohibitive for all but the wealthiest in the developing world. The cost of access in a country will often determine the way IT and Internet services are delivered. For example, lower cost Internet service in many African, Asian, and Latin American countries is delivered through community access locations such as "cyber cafes," libraries, publicly funded telecenters, and others. In South Korea, cafe-style "PC rooms" are popular places to go online or do homework.

High access charges also exist in many developed nations. About 65 percent of all Internet users in Japan gain access through the telephone network of Nippon Telegraph and Telephone (NTT). However, NTT has not lowered access fees in 23 years, charging about $2 an hour for local calls. Similarly, in Western Europe, e-commerce activities continue to be hampered by high per-minute telephone tolls.

Chart 3: Average regional cost of 1 hour local call, 1999 ($)

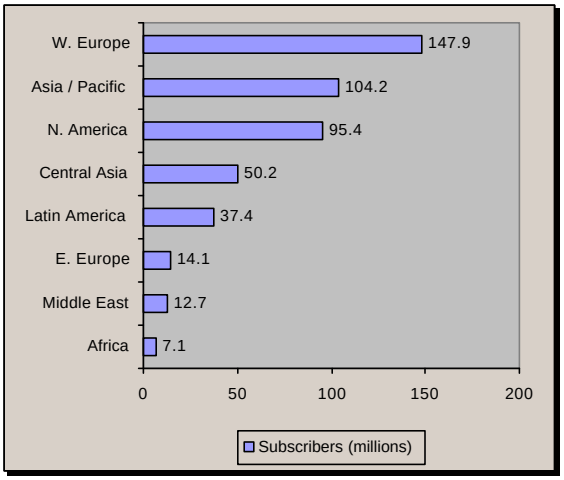


Note: Data from selected pool of countries; includes all taxes
Source: ITU

The faults per 100 main telephone lines per year is an indication of the reliability and quality of a telecommunications provider, in most cases a Public Telecommunications Operator (PTO). In many developing countries, the PTO is the sole Internet Service Provider or controls the backbone and gateway through which other ISPs operate. Unreliable phone service will hinder use of the Internet. For example, in some countries users are frequently disconnected from their network connection, necessitating a reconnect every 15 minutes or so.

Cellular phone and cellular subscriber density data are useful in evaluating a market's acceptance of wireless communications as an alternative or supplement to landlines. For example, Japan's high rate of cellular phone usage vis-à-vis its somewhat lower PC penetration rate has opened up new opportunities for wireless-based Internet service providers. In parts of the developing world, wireless and satellite-based systems enable users to bypass inadequate landline telephone networks.

Chart 4: Wireless subscribers, 2000



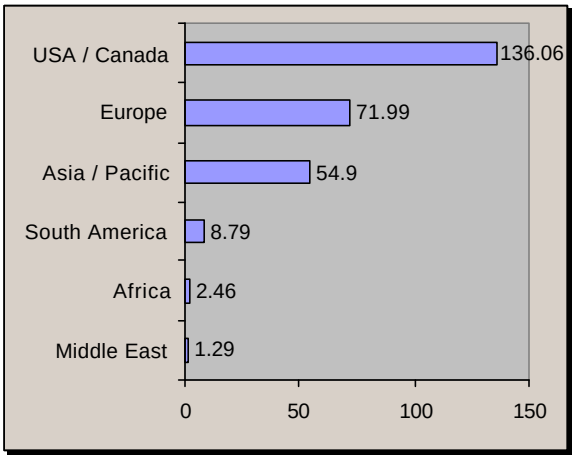
Note: Data from all countries
Source: Ovum: Mobile@Ovum

IT and Internet infrastructure

The information technology and Internet infrastructure are further indicators of a country's level of IT usage. The number of PCs per 1,000 residents, Internet hosts per 10,000 residents, and the total number of Internet hosts show both a country's total

investment in IT goods and services and its broader diffusion. The number of Internet users per 100 residents and the total number of users is an indicator of overall usage and acceptance.

Number of Internet users by region, Feb. 2000 (millions)



Source: Nua.ie

Internet Service Providers (ISPs) are highly reliant upon the regulatory environment and the telecom infrastructure for their operations. In many developing markets, ISPs are dependent upon the PTO for access to the Internet backbone. Some PTOs do not allow independent ISPs to operate at all. These markets tend to have higher Internet access prices. The high costs of equipment and bandwidth access for ISPs, relative to per capita income, inhibit start-up operations in many less developed countries. These and other factors make the ISP sector very volatile. Data on the number of ISPs in a given country is often difficult to collect.

Forecast: Top five countries in Internet use in 2005

United States	126.6 million users
China	37.3
Japan	34.7
Germany	17.5
Canada	17.2

Source: CyberAtlas

IT spending as a percentage of GDP is a direct indicator of the IT market in any given country. Less developed countries tend to have lower IT spending numbers, signifying less overall IT usage and integration throughout the economy. Wealthier nations will often have high IT spending percentages, indicating that IT has been more fully incorporated into their economic structure. As the charts in the following section show, there is generally a positive relationship between higher rates of IT spending with indicators of IT usage.

Number of users for web sites worldwide, Dec. 1999 (millions)

Web / digital media properties	Web sites
1. AOL Network (53.78)	1. Yahoo.com (36.40)
2. Yahoo sites (42.36)	2. Msn.com (32.74)
3. Microsoft sites (40.48)	3. Aol.com (29.34)
4. Lycos (30.34)	4. Microsoft.com (25.45)
5. Excite@Home (27.67)	5. Netscape.com (21.70)
Education web sites	**Government web sites**
1. Berkeley.edu (1.65)	1. Nasa.gov (2.295)
2. Mit.edu (1.36)	2. Usps.gov (2.294)
3. Umich.edu (1.30)	3. Ca.gov (1.30)
4. Utexas.edu (1.20)	4. Nih.gov (1.26)
5. Msu.edu (1.17)	5. Noaa.gov (1.23)

Note: Unique users for December, 1999; Web / digital properties refer to all the sites under a brand identity
Source: Media Metrix

Usage patterns and analysis

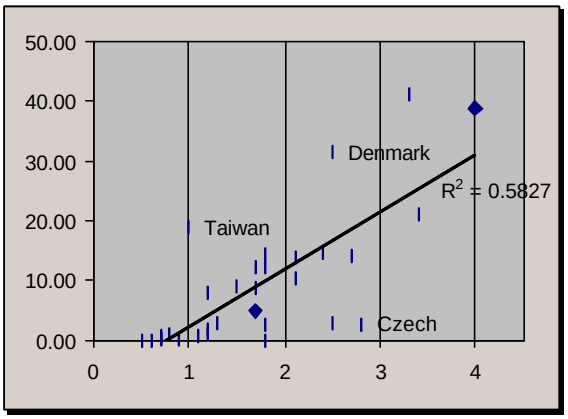
Most of the telecommunications and IT / Internet indicators are in some way influenced by market or non-market factors specific to each country. For example, the number of ISPs in a country is highly dependent upon the extant regulatory environment. The cost of a one-hour local call will vary depending on local and national tax or toll rates. Even the overall awareness of IT in the general population will affect the data and should be taken into consideration when assessing country indicators. For example, a September 1999 poll conducted in China found that just 14 percent of people knew what the Internet was and that nine out of ten people had never even used a computer.[22]

It is impossible within the scope of this

[22] Agence France-Press, 09/23/99

report to examine each country's IT usage environment beyond the select group of indicators used. Moreover, even the trends shown below are but a rough approximation of general patterns. The pool of countries was limited to major markets and is not comprehensive. Some indicators are from different years, while others were compiled by third parties using different methodologies. On the whole, however, it is useful to see the broad relationships emerge.

Chart 5: Internet users / 100 (y-axis)
and IT spending as % of GDP (x-axis)

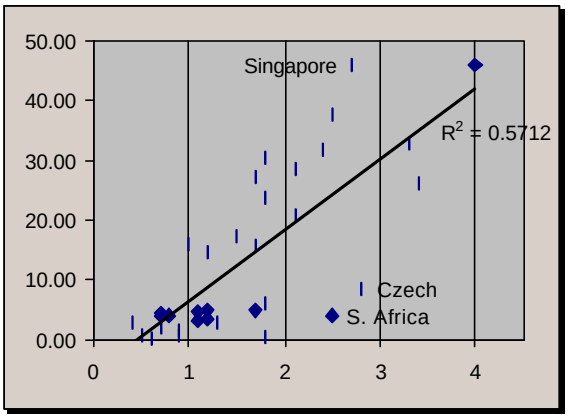


Note: Data from selected pool of countries; trendline shown; not all country data was available

Overall investment in information technology varies widely from country to country. In the tables in the appendix that show IT indicators for selected countries in different regions of the world, the IT spending as a percentage of GDP data range from 0.4 (Bulgaria) to 4 percent (USA). The indicators suggest a correlation between higher levels of IT spending with a broader diffusion and usage of IT in the economy. For example, the scatter graph (chart 5) below shows a simple linear regression[23] of IT spending and Internet user density. There is a positive relationship between the two data sets, but the relationship is moderate as the R-squared value is 0.5827[24].

Chart 6, with PC density and IT spending, also shows a moderately positive relationship. In this case the R-squared value is 0.5712. The IT spending indicator's differing composition by country probably explains the divergence between this pairing and the very strong relationship shown in chart 9, PC density and per capita GDP. In other words, PC spending is a different proportion of overall IT spending for each country, resulting in a weaker R-squared value for chart 6.

Chart 6: PCs / 100 (y-axis)
and IT spending as % of GDP (x-axis)



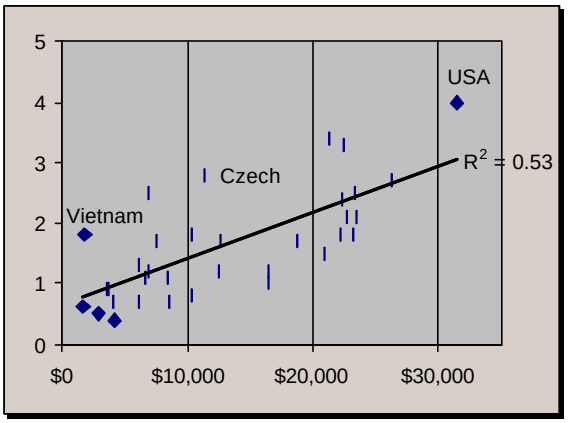
Note: Data from selected pool of countries; trendline shown; not all country data was available

On the whole, countries that have higher levels of IT investment also tend to have higher per capita GDPs. The tables in the appendix show that developed countries like the U.S. or Japan have IT spending rates (as a percentage of GDP) several times higher than less-affluent nations like Thailand or Indonesia. The scatter chart below (chart 7) of IT spending and per capita GDP shows that a positive relationship exists between these two indicators. However, the correlation is moderate, as the R-squared value is only 0.53.

[23] A line calculated by least squares representing the equation y = mx + b

[24] The R-squared value equals the percentage of variation in y that this relationship explains; it is the "fit" of data points around the trendline

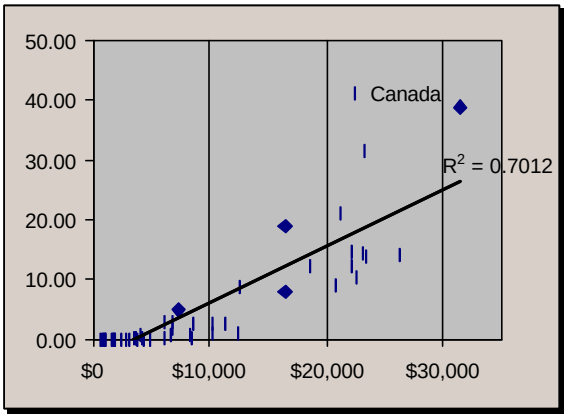
Chart 7: IT spending as % of GDP (y-axis)
and Per capita GDP (x-axis)



Note: Data from selected pool of countries; trendline shown; not all country data was available

Chart 7 shows that certain developing countries like Vietnam and the Czech Republic are spending a great deal more on IT vis-à-vis their relatively lower per capita GDPs. This may mean that they are gradually "catching up" with more developed nations in IT usage.

Chart 8: Internet users / 100 (y-axis)
and Per capita GDP (x-axis)

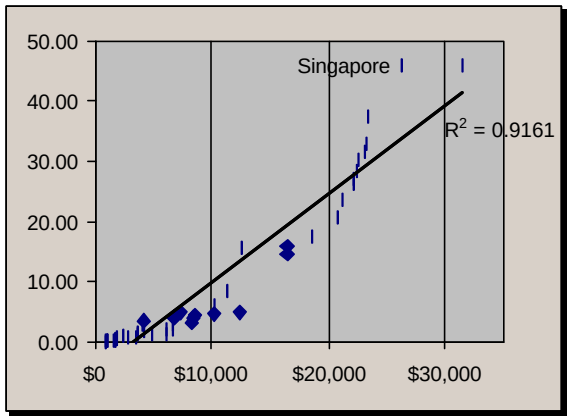


Note: Data from selected pool of countries; trendline shown; not all country data was available

The positive IT spending / per capita GDP relationship shown in chart 7 suggests that technology has become more fully integrated into the economies of developed nations. Hence higher per capita GDPs suggest greater levels of IT usage for both businesses and consumers. This can be seen when the number of Internet users per 100 residents is regressed on per capita GDP (chart 8).

The relationship is positive, with a moderately strong R-squared of 0.7012. A tighter correlation can be witnessed when PCs per 100 residents is regressed on per capita GDP (chart 9). In this case, the R-squared value of 0.9161 indicates that ownership of computers is very tightly linked with per capita income levels, at least within our group of countries. This suggests a pure market effect for PCs: more money means you purchase more of them. On the other hand, the lower R-squared value for the Internet user density and per capita GDP pairing can probably be attributed to the specific market, regulatory, or infrastructure conditions of different countries (see section on IT for development).

Chart 9: PCs / 100 (y-axis)
and Per capita GDP (x-axis)

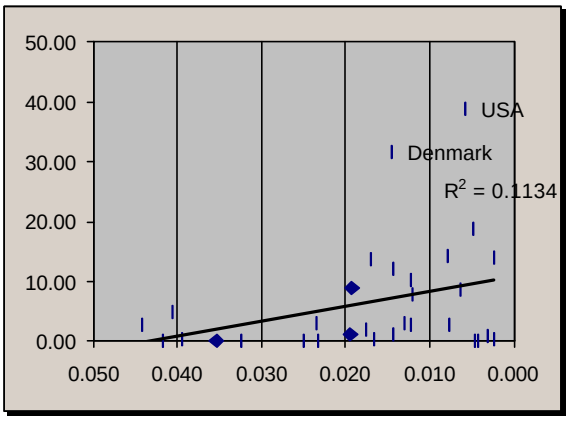


Note: Data from selected pool of countries; trendline shown; not all country data was available

One market variable that has a major impact on Internet usage is the cost of a local call. High taxes or tolls on local calling can adversely affect dialup Internet access. Although this is especially true in the developing world, calling costs have also been pinpointed as a major reason for lower Internet usage rates in Western Europe and Japan relative to the United States. However, a scatter chart showing the

relationship between Internet user density and the cost of a local call (as a percentage of per capita GDP) shows an extremely weak relationship (chart 10).

Chart 10: Internet users / 100 (y-axis)
and Cost of local call as % of per capita GDP (x-axis)



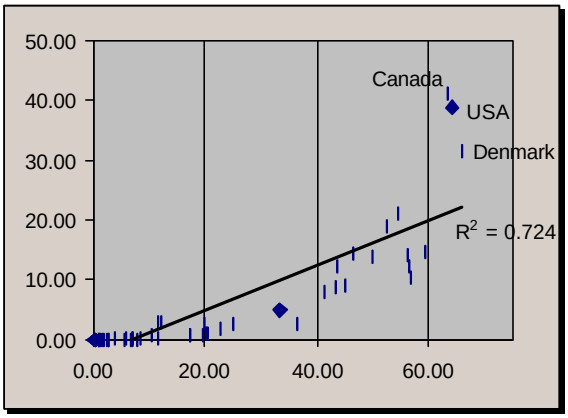
Note: Data from selected pool of countries; trendline shown; not all country data was available; data points with call costs greater than 0.06% were removed for purposes of this chart

In this case, it should be noted that this chart cuts off countries with calling costs higher than 0.06 percent of per capita GDP, which eliminates a large portion of the African countries and several others from different regions in the developing world. All of these countries had Internet user density rates close to zero with cost percentages far greater than 0.06 (such as Uganda's 0.824), and their inclusion would have markedly skewed the graph.

The weak R-squared shown by the remaining countries (0.1134) most likely indicates that middle- to high-income countries' Internet usage rates are not as impacted by calling costs than are less developed countries. All of the developed countries in the selected group have calling cost percentages lower than 0.02 (the U.S. was 0.006), so their Internet user density rates may be more affected by factors other than calling cost. Denmark's $3.40 call charge per hour is high, but means something different to a Copenhagen-based dialup user than Mali's $2.82 per hour rate to a user in Bamako.

Another telecommunications indicator that could affect Internet usage is the number of telephone lines per 100 residents, or teledensity (chart 11). The high R-squared for this scatter chart indicates a strong relationship between teledensity and Internet usage. This seems logical, as higher teledensities are indicators of better telecommunications infrastructures, which are necessary for Internet accessibility.

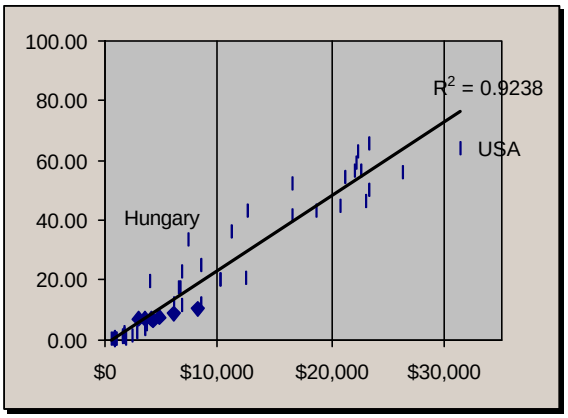
Chart 11: Internet users / 100 (y-axis)
and Phone lines / 100 (x-axis)



Note: Data from selected pool of countries; trendline shown; not all country data was available

On the other hand, teledensity maps well to per capita GDP, as seen in chart 12, so the high correlation may simply be an income effect. The R-squared values for charts 11 and 8 are similar, as are the values for charts 12 and 9. The relative strength of the latter two correlations is evidence that measures like PC density or teledensity are directly proportional to national income, whereas Internet usage is an indicator affected by a number of variables, only one of which is per capita GDP.

Chart 12: Phone lines / 100 (y-axis)
and Per capita GDP (x-axis)



Note: Data from selected pool of countries; trendline shown; not all country data was available

On the whole, the indicator data sets paired and regressed above show that:

- IT usage as measured by Internet users per 100 and PCs per 100 increases with higher per capita GDPs and greater national IT spending percentages;
- These two IT usage measures named above are more strongly correlated with incomes (per capita GDP) than with IT spending (IT spending as a percentage of GDP);
- The number of phones lines per 100 residents (teledensity) is also strongly linked with per capita GDP;
- Internet usage is perhaps less affected by calling costs in the developed world than in the developing world;
- There is a positive relationship between IT spending and per capita GDP.

Further examination of the different sets of indicators by region is necessary to distinguish usage patterns within country groupings.

Regional overviews

The following regional overviews present a snapshot of the existing IT and Internet usage environments in different markets.

The countries in the tables below are selections of note from the more comprehensive tables in the appendix. Although the sample used for this study did not include every country in each region, it does offer an illustrative cross-section of significant markets.

Africa

The fifteen African countries covered in this report are part of the sub-Saharan region, which had an estimated 636 million people in 1998 or about 9 percent of the total world population. Nigeria was by far the most populous nation on the African continent with a population exceeding 113 million. Of the selected countries, Botswana was the smallest at 1.46 million.

African basic indicators

Although Nigeria is by far and away the most populous African nation, it is not in the top five either in income or literacy rates. South Africa is the only country in the top five for all three categories. Botswana, Kenya, and Zimbabwe are the only other countries to appear in the top five for two of the categories.

There does not seem to be a positive correlation between population and per capita GDP with the exception of South Africa. The next four richest African nations are all relatively small. Likewise, there is no direct relationship between either population or per capita GDP with literacy rates. The three most literate nations, Zimbabwe, Kenya, and Zambia, are not in those positions in either of the other categories.

Population	Per capita GDP	Literacy (male)
1. Nigeria	1. South Africa	1. Zimbabwe
2. Ethiopia	2. Namibia	2. Kenya
3. South Africa	3. Botswana	3. Zambia
4. Tanzania	4. Zimbabwe	4. South Africa
5. Kenya	5. Ghana	5. Botswana

Countries in Sub-Saharan Africa have the lowest average levels of national income and literacy. Their telecommunications and IT infrastructures are also less advanced compared to the other regions examined. A

wide gap exists between sub-Saharan Africa and the rest of the world. Case in point: a majority of the region's population has never made a telephone call.[25]

African telecommunications indicators
Countries near South Africa, such as Botswana, Namibia, and Zimbabwe, seem to do well in most of the categories. They may benefit from their proximity to South Africa, with which they have extensive interconnections and access to international bandwidth. Nearby Mozambique, emerging after twenty years of civil strife and recent disastrous flooding, is the exception. Countries in other parts of Africa that do well are Senegal and Cote d'Ivoire.

(Botswana is a standout – the PTT operates an advanced network with almost 100 percent digital exchanges and an optic fiber transmission system around the whole country. Conversely, some parts of Namibia still have manually switched telephone exchanges (via an operator), making data connections nearly impossible.)

Phone lines / 100	Cellular subscribers / 100	Faults / 100 lines
1. South Africa	1. South Africa	1. Botswana
2. Namibia	2. Botswana	2. Senegal
3. Botswana	3. Namibia	3. South Africa
4. Zimbabwe	4. Cote d'Ivoire	4. Namibia
5. Senegal	5. Zimbabwe	5. Cote d'Ivoire

This region must address issues that inhibit the growth of information technology usage. These range from the very basic, such as the provision of reliable electrical power, to ill-conceived tax codes that treat IT products as luxury items and put them out of the reach of most African consumers. The situation is improving, however. Spurred by the information revolution occurring in most other parts of the world, many African governments are beginning to deregulate and liberalize their telecommunications and information technology markets. This has increased the number of phone lines, Internet provision, and methods of communication. (For many countries the PTO is a major source of government revenue, so complete privatization may have a negative impact on medium- to longer-term public investment.)

African IT and Internet indicators
South Africa occupies the top position in all the categories, with its Southern African Development Community (SADC) neighbors Botswana, Namibia, and Zimbabwe usually nearby. South Africa's indicators are comparable to that of many developed nations. Nigeria is at or near the bottom for Internet host and user density, but is sixth in PC density and fourth in total number of ISPs. This country, the largest in Africa, has a total of only 3000 Internet users but has one PC for every 200 residents. Clearly there a great many computer users that have yet to go online in Nigeria.

Internet users / 100	PCs / 100	IT spending as % of GDP
1. South Africa	1. South Africa	1. South Africa
2. Botwana	2. Namibia	
3. Namibia	3. Botswana	
4. Zimbabwe	4. Senegal	
5. Kenya (tie)	5. Zimbabwe	
5. Uganda (tie)		

Note: Data was unavailable on IT spending for most of the surveyed countries

An increasing number of companies and organizations have projects underway in sub-Saharan Africa: Malaysia Telecom's SAFE (South Africa – Far East) undersea fiber project; Washington, D.C.-based WorldSpace Corp.'s AfriStar satellite broadcasting initiative; and the SAT-3/WASC (South Atlantic Telephony / West African Submarine Cable) venture. The African satellite consortium owned by the African PTOs, RASCOM (Regional African Satellite Communications), is actively working to interconnect rural and remote parts of the region. Services offered by satellite operators such as Iridium also serve to benefit Africa.

Many multilateral and governmental institutions are involved in African IT development projects, including the World Bank, United Nations, and the U.S. Agency for International Development. Examples of

[25] UNESCO (Mike Jensen)

projects include the World Bank infoDev's US$1 million African Virtual University project, and the UNDP Africa Bureau's US$6 million fund to improve Internet connectivity in Africa called the Internet Initiative for Africa (IIA).[26]

Asia

The large size of the entire Asia / Pacific region necessitated a focus on East Asia for the purposes of this report. All ten of the countries examined, with the exception of India, are in East Asia. The diversity within this group is still immense – the largest country, China, is the most populous in the world at over a billion people, while the smallest, Singapore, is a city-state barely the size of Washington, D.C. Income levels, telecommunications, and IT indicators are similarly diverse. The only fairly steady indicator is literacy rates, which are extremely high for every Asian nation except India. For the purposes of this report, Japan was included with the developed countries.

Asian basic indicators

China, India, and to a certain extent Indonesia are the three countries with the largest populations. On the other hand, none of these countries make the top five in per capita GDP. Singapore is the wealthiest nation with the highest per capita GDP. None of the rest of the top five wealthiest are in the top five in population. However, Singapore, a city-state, is substantially smaller than the next-to-last country, Malaysia.

In terms of literacy, all of the Asian countries have very high percentages. India is the exception, with much lower literacy rates than the other Asian countries. Given the region's generally high level of literacy, this indicator may be somewhat moot. With regard to market size, most of the very populous countries like Indonesia and Vietnam are very low on the income scale, while the richest country, Singapore, has roughly the population of metropolitan Washington, D.C.

Population	Per capita GDP	Literacy (male)
1. China	1. Singapore	1. South Korea
2. India	2. Taiwan	2. Vietnam
3. Indonesia	3. South Korea	3. Thailand
4. Philippines	4. Malaysia	4. Singapore
5. Vietnam	5. Thailand	5. Philippines

The Asian region has countries with telecom and IT indicators comparable (or sometimes exceeding) those of many developed nations and contains other countries with indicators among the lowest in the world. These indicators usually contain a particular country's level of economic development, as represented by per capita GDP. Singapore, for instance, had the highest income level of the group and did extremely well in all of its telecom and IT indicator categories. Conversely, Vietnam and India had the lowest per capita GDPs and had correspondingly low numbers on most usage measures.

Asian telecommunications indicators

Singapore, Taiwan, and Korea are at or near the top in every category except phone line growth. On the other hand, the three countries that are generally near the bottom in all the categories make up the top three in phone line growth: Vietnam, China, and the Philippines. These nations are starting from a low base and are heavily investing in their telecommunications infrastructure. Thailand, Indonesia, and Malaysia generally inhabit the middle range of these indicators.

Phone lines / 100	Cellular subscribers / 100	Faults / 100 lines
1. Singapore	1. Singapore	1. Singapore
2. Taiwan	2. Korea	2. Taiwan
3. Korea	3. Taiwan	3. Korea
4. Malaysia	4. Malaysia	4. Indonesia
5. Thailand	5. Thailand	5. Thailand

A major factor affecting the range of indicators is government regulation. Policies ranging from censorship of the Internet to state-ownership of telecommunications access create a gradient of IT usage levels across the region. For example, Singapore's fairly enthusiastic

[26] Ibid

approach to Internet regulation has limited the country to three Internet Service Providers (ISPs), while the Philippine's relatively casual approach has sparked the creation of 145 ISPs. In Vietnam, the government has implemented a firewall that blocks access to certain Internet sites and in the process has disrupted Internet performance in that country.

Asian IT and Internet indicators
Singapore, Taiwan, and Korea occupy the top three spots in four of the seven categories: host density, hosts, user density, and PC density. Conversely, Vietnam claims the bottom position in five of the seven categories, and is next-to-last in another.

Taiwan is number one in total hosts and total users, and even edges out Singapore in user density. As could be expected, Singapore was number one in IT spending as a percentage of GDP, but surprisingly Vietnam was tied for second with Malaysia. This indicates that Vietnam may improve its standing in the future.

Internet users / 100	PCs / 100	IT spending as % of GDP
1. Taiwan	1. Singapore	1. Singapore
2. Singapore	2. Taiwan	2. Malaysia (tie)
3. Korea	3. Korea	2. Vietnam (tie)
4. Malaysia	4. Malaysia	4. Korea
5. Philippines	5. Thailand	5. Taiwan

Despite uneven regulations, policies, and the East Asian financial crisis, the telecommunications and IT sectors continue to grow in this region. Most of the countries recognize the value of IT, and have attempted to enact measures that encourage the growth of the sector. For example, Malaysia has its Multimedia Super Corridor (MSC), Thailand launched its IT-2000 initiative, and Indonesia is trying to create a national information infrastructure under a plan called Nusantara 21. Companies from regional leaders in IT usage like South Korea, Taiwan, Singapore, and Japan (as well as Australia and New Zealand) are actively involved in these projects and have major investments throughout the lesser-developed parts of the region.

Various multilateral organizations, as well as business consortiums, are operating in the region. The UNDP's Asia Pacific Development Information Program (APDIP), based in Kuala Lumpur, and the Singapore-based Asia Pacific Networking Group (APNG) are two organizations promoting the use of IT among Asia's developing countries. Telecommunications initiatives include FLAG (Fiber Optic Link around the Globe) which connects the rest of the world with countries including Korea, Singapore, and China, and SEA-ME-WE 3, which in Asia connects Singapore, Australia, Korea, and Japan.

Latin America

Like Asia, Latin America is characterized by a diversity of markets and usage levels. The twelve countries used for this report include hemispheric giants Brazil and Mexico, as well as very small countries such as Costa Rica and Uruguay. Income levels range from better-off Chile or Argentina to relatively poor Bolivia or Peru. Literacy rates are Asian-like as well: 11 of the 12 countries in the pool have rates above 90 percent.

Latin American basic indicators
Mexico and Brazil are by far the two most populous countries in this region, while Costa Rica and Uruguay are similar in size to Singapore.

While Mexico is number five in per capita GDP, Brazil is absent from the top five in either per capita GDP or literacy rates. Argentina, Chile, and Uruguay are present in the top five for both per capita GDP and literacy. Argentina is also fourth in population. Peru is top five for both population and literacy.

Population	Per capita GDP	Literacy (male)
1. Brazil	1. Chile	1. Uruguay
2. Mexico	2. Argentina	2. Argentina
3. Colombia	3. Uruguay	3. Chile
4. Argentina	4. Venezuela	4. Costa Rica
5. Peru	5. Mexico	5. Peru

The Latin American (and Caribbean) region contain approximately 6 percent of the world's population and account for 3 percent of global IT investment, whereas North America, with 5 percent of the world's population, accounts for 45 percent of global IT investment.[27] However, the Latin American IT market is forecast to grow much higher than the world average over the next several years. Much of this will be due to large-scale government deregulation and privatization, which is attracting substantial foreign investment.

Latin American telecommunications indicators
The two biggest countries by population, Brazil, and Mexico, are either lodged in the middle of the group or near the bottom in most all categories. Uruguay is tops in both teledensity and largest city teledensity, while Chile was second in teledensity and fourth in phone line growth, perhaps presaging a move to first place in teledensity in the near future. Argentina was third in both teledensity and largest city teledensity, but only ninth in phone line growth.

Phone lines / 100	Cellular subscribers / 100	Faults / 100 lines
1. Uruguay	1. Venezuela	1. Brazil
2. Chile	2. Argentina	2. Venezuela
3. Argentina	3. Chile	3. Mexico
4. Colombia	4. Uruguay	4. Argentina
5. Costa Rica	5. Colombia	5. Peru

Various organizations are working on projects to promote IT usage in the region. The Organization of American States launched the RedHUCyT (Hemisphere-wide Inter-University Scientific and Technological Information Network) project in 1991. RedHUCyT's main objective is to create an electronic network for the exchange of scientific and technological information. Another project is UNESCO's General Information Program, which attempts to link libraries in the region together via the Internet.

[27] UNESCO (Nagib Callaos)

Latin American IT and Internet indicators
Mexico, Chile, Argentina are in the top five for all seven categories, with Brazil in the top five for six. Bolivia, Ecuador, Paraguay, and Peru generally were in the lower end of all the categories. Brazil and Uruguay were the only two countries with more than two percent of their populations on the Internet, and Brazil's total online population was a large 5.1 million. The country with the next largest online population, Mexico, only had 900 thousand.

Internet users / 100	PCs / 100	IT spending as % of GDP
1. Brazil	1. Chile	1. Brazil
2. Uruguay	2. Mexico	2. Chile
3. Chile	3. Venezuela	3. Colombia (tie)
4. Argentina	4. Argentina	3. Mexico (tie)
5. Mexico	5. Colombia (97)	5. Argentina

Eastern Europe

The greater Eastern European region encompasses a broad spectrum of countries that are generally post-Communist states of the former Soviet bloc. While this category includes nations from former Soviet republics like Azerbaijan to Mediterranean countries such as Albania, this report focuses on a small sample of countries that have generally emerged as significant U.S. trading partners. Within this group, Russia clearly stands out for its size and continued political influence. However, as noted above, countries with higher per capita GDPs tend to have a greater role for IT in their economic activity. This proves true with the Eastern Europe region, as the Czech Republic tends to do well in most usage indicators as its higher per capita GDP would suggest.

Eastern European basic indicators
Russia far outshadows any of the other countries listed in terms of population, but is less impressive in terms of per capita GDP – fifth out of five countries. Despite dated data on literacy rates, it seems like all the countries have near universal male literacy.

The Czech Republic was first in per capita GDP and was third in population. Poland was second in population and third in per capita GDP.

Population	Per capita GDP	Literacy (male)
1. Russia	1. Czech Republic	1. Russia
2. Poland	2. Hungary	2. Bulgaria (tie)
3. Czech Republic	3. Poland	2. Hungary (tie)
4. Hungary	4. Bulgaria	2. Poland (tie)
5. Bulgaria	5. Russia	

While this regional country sample tends to do better than its counterparts in other developing regions, there is still a wide chasm between it and its neighbors to the west. The historical legacy of central planning have given many of these nations an inefficient and unproductive information infrastructure, which is reflected in its relatively low IT and Internet penetration rate. Efforts over the past decade have been concentrated on reviving economic growth and reforming labor markets, with technology modernization progressing at a somewhat slower pace. Much of the IT investment occurring in this region has tended to be oriented towards PC-level technologies, including low-end office equipment and LAN hardware. The Czech Republic is the exception, as personal computers represent less than 35 percent of IT spending, with the remainder being shifted to implementation services and software development.[28]

Eastern European telecommunications indicators
The Czech Republic does well in teledensity, largest city teledensity, and phone line growth, but poorly in the faults per 100 lines. Hungary does well in both overall teledensity and rate of phone line growth, but somewhat less well in teledensity for Budapest. The data for largest city teledensity is from 1996, so considering Hungary's top position in phone line growth, Budapest could rank higher in the near future. Bulgaria is notable primarily for its inexpensive local phone calls and low number of faults per 100 lines.

[28] UNESCO (Karol Jakubowicz)

Phone lines / 100	Cellular subscribers / 100	Faults / 100 lines
1. Czech Republic	1. Hungary	1. Bulgaria
2. Hungary	2. Czech Republic	2. Hungary
3. Bulgaria	3. Poland	3. Russia
4. Poland	4. Bulgaria	4. Czech Republic
5. Russia	5. Russia	

The degree of telecommunications liberalization varies from country to country, often depending on whether a nation aspires to EU membership and its attendant policy harmonization. Overall, the trend is positive. Warsaw has begun to privatize Poland Telecom, Hungary has sold most of its PTT to a consortium of Deutsch Telecom and Ameritech, and Prague has given management control of its PTT to a Dutch / Swiss group. State-controlled monopolies are gradually giving way to private markets in much of this region, although Russia and its former republics are further behind in their reform efforts.

Eastern European IT and Internet indicators
Hungary was number one in both host density and user density, and second in PC density and IT spending as a percentage of GDP. Russia was last on host density, but first in total number of hosts and total number of Internet users. This is obviously a function of Russia's large population. The Czech Republic was top in PC density, ISPs, and IT spending.

Internet users / 100	PCs / 100	IT spending as % of GDP
1. Hungary	1. Czech Republic	1. Czech Republic
2. Czech Republic	2. Hungary	2. Hungary
3. Poland	3. Russia	3. Poland
4. Russia	4. Poland	4. Russia
	5. Bulgaria	5. Bulgaria

Eastern Europe has benefited from its proximity to the European Union. The EU has implemented various programs to assist Eastern European countries in their IT and telecom modernization efforts. Since 1995, annual forums have been held by the European Commission to develop joint policies, strategies, and fund IT initiatives

throughout Eastern Europe. The Phare Fund, which provides monies for telecommunications and regulatory training, as well as co-financing for Eastern European participation in EU programs like INFO2000 and the Multi-lingual Information Society, are examples of EU assistance.

The Developed World

This report includes within the developed world pool Western Europe, the United States, Canada, and Japan. All of the countries in the developed world category have very high levels of IT and Internet usage. The United States in particular has exceptionally high rates of technology penetration, as seen in its top position on nearly all the indicator charts. This is true even when compared with other regions. There are many possible reasons for America's widespread use of information technology: rapid initial adoption; social acceptance of technical change; fluid labor markets; and a cultural predilection for risk-taking are a few.

Developed World basic indicators
The United States dominates all other countries in terms of population and per capita GDP. Data on literacy was unavailable for this report. The other developed nations had roughly similar per capita GDP levels.

Population	Per capita GDP
1. USA	1. USA
2. Japan	2. Belgium
3. Germany	3. Denmark
4. France	4. Japan
5. UK	5. France

The United States is the global leader in IT usage, but the other countries in this category also exhibit high usage rates. Major shifts such as the emergence of global markets, media and technological convergence, and satellite- and fiber-based telecommunications have had a major impact on countries best suited to take advantage of them, which for the most part are the developed nations.

Developed World telecommunications indicators
There are no clear standouts in the developed world, aside from the United States. The United States is in the top five for all the categories and is the only country to hold this distinction.

Phone lines / 100	Cellular subscribers / 100	Faults / 100 lines
1. Denmark	1. Japan	1. Spain
2. USA (97)	2. Denmark	2. Japan
3. Canada	3. Italy	3. Netherlands
4. Netherlands	4. Ireland	4. USA
5. France	5. USA	5. France

Many developed countries are engaged in efforts to further cultivate their IT sectors, such as telecom deregulation and investment in research and development. As noted at the beginning of this study, the potential payoffs from a vibrant information technology sector are great. The ability of IT, in its use and application, to spin off related service and manufacturing industries is a prized benefit that most developed nations are seeking.

Developed World IT and Internet indicators
With the exception of Internet user density, the United States was by a large margin number one in every single category. Canada was number one in user density, but only marginally above the United States. America's online population was staggering – over 106 million residents use the Internet, comparable to the entire population of Japan or Nigeria. Moreover, the United States is home to over 33 million host servers, a number equal to the human populations of the Netherlands and Belgium combined.

Internet users / 100	PCs / 100	IT spending as % of GDP
1. Canada	1. USA	1. USA
2. USA	2. Denmark	2. UK
3. Denmark	3. Canada	3. Canada
4. UK	4. Netherlands	4. Denmark
5. Netherlands	5. Germany	5. Netherlands

Conclusions

There is a growing consensus around the world that information technology (IT) investment plays a key role in promoting economic growth and development. In the United States, the use of IT has boosted productivity, created many new types of jobs, helped to restrain inflation, and has contributed to an unprecedented period of sustained economic growth. By improving organizational efficiencies and capabilities, IT deployment and utilization also has many social benefits. The spread of IT in developing countries shows great promise for enhancing educational systems through the use of distance-learning programs, improving rural health care, and creating new markets for small enterprises.

Patterns of IT usage can be broadly illustrated by indicators, such as the number of phone lines per resident, the installed base of PCs, and the number of Internet users and ISPs. Countries with higher per capita GDP tend to have more developed telecommunications infrastructures and greater levels of IT spending, and this generally results in more widespread IT usage among the population. For example, in Asia, Eastern Europe, Latin America, Africa, and the group of developed world nations, the country with the greatest GDP/capita also has the largest number of telephone lines and PCs per 100 residents. The only exceptions are Chile and the United States, which are second in their groups in terms of the number of telephone lines per resident. However, despite income levels, qualitative factors, such as government regulation, high user fees, and reduced public awareness will limit overall IT usage.

There is a large disparity in usage among regions. Developed countries in Western Europe and North America have levels of usage that indicate a broad diffusion and integration of IT in their economies. Countries in Asia, Eastern Europe, and Latin America reflect a more diverse pattern of usage that is generally lower than in the developed world. Africa, with the exception of South Africa, is far behind any of the other areas with a very low rate of IT and telecommunications penetration.

Feedback

We welcome your comments. Please contact Raymond Cho at raymond_cho@ita.doc.gov or via phone at 202-482-0551.

APPENDIX – DATA FOR SELECTED COUNTRIES
Basic Indicators

Table 1: Basic indicator rankings for Africa

Population (millions)		Per capita GDP ($, ppp, 98)		Literacy rates* (%, 95)	
1. Nigeria	113.83	1. South Africa	6,800	1. Zimbabwe	90.0
2. Ethiopia	59.68	2. Namibia	4,100	2. Kenya	86.3
3. South Africa	43.43	3. Botswana	3,600	3. Zambia	85.6
4. Tanzania	31.27	4. Zimbabwe	2,400	4. South Africa	81.9
5. Kenya	28.81	5. Ghana	1,800	5. Botswana	80.5
6. Uganda	22.80	6. Cote d'Ivoire	1,680	6. Tanzania	79.4
7. Mozambique	19.12	7. Senegal	1,600	7. Ghana	75.9
8. Ghana	18.89	8. Kenya	1,550	8. Uganda	73.7
9. Cote d'Ivoire	15.81	9. Uganda	1,020	9. Nigeria	67.3
10. Zimbabwe	11.16	10. Nigeria	960	10. Mozambique	57.7
11. Mali	10.43	11. Mozambique	900	11. Cote d'Ivoire	57.0
12. Senegal	10.05	12. Zambia	880	12. Ethiopia	45.5
13. Zambia	9.66	13. Mali	790	13. Senegal	43.0
14. Namibia	1.65	14. Tanzania	730	14. Mali	39.4
15. Botswana	1.46	15. Ethiopia	560	*. Namibia	N/A

Table 2: Basic indicator rankings for Asia

Population (millions)		Per capita GDP ($, ppp, 98)		Literacy rates* (%, 95)	
1. China	1246.87	1. Singapore	26,300	1. Korea	99.3
2. India	1000.85	2. Taiwan	16,500	2. Vietnam	96.5
3. Indonesia	216.11	3. Korea	12,600	3. Thailand	96.0
4. Philippines	79.35	4. Malaysia	10,300	4. Singapore	95.9
5. Vietnam	77.31	5. Thailand	6,100	5. Philippines	95.0
6. Thailand	60.61	6. China	3,600	6. Taiwan	93.0
7. Korea	46.88	7. Philippines	3,500	7. China	89.9
8. Taiwan	22.11	8. Indonesia	2,830	8. Indonesia	89.6
9. Malaysia	21.38	9. Vietnam	1,770	9. Malaysia	89.1
10. Singapore	3.53	10. India	1,720	10. India	65.5

Source: CIA World Factbook, 1999

Note: Male literacy rates are used

Table 3: Basic indicator rankings for Latin America

Population (millions)		Per capita GDP ($, ppp, 98)		Literacy rates* (%, 95)	
1. Brazil	171.85	1. Chile	12,500	1. Uruguay	96.9
2. Mexico	100.29	2. Argentina	10,300	2. Argentina	96.2
3. Colombia	39.31	3. Uruguay	8,600	3. Chile	95.4
4. Argentina	36.74	4. Venezuela	8,500	4. Costa Rica	94.7
5. Peru	26.62	5. Mexico	8,300	5. Peru	94.5
6. Venezuela	23.20	6. Costa Rica	6,700	6. Paraguay	93.5
7. Chile	14.97	7. Colombia	6,600	7. Ecuador	92.0
8. Ecuador	12.56	8. Brazil	6,100	8. Mexico (tie)	91.8
9. Bolivia	7.98	9. Ecuador	4,800	8. Venezuela (tie)	91.8
10. Paraguay	5.43	10. Peru	4,300	10. Colombia	91.2
11. Costa Rica	3.67	11. Paraguay	3,700	11. Bolivia	90.5
12. Uruguay	3.31	12. Bolivia	3,000	12. Brazil	83.3

Table 4: Basic indicator rankings for Eastern Europe

Population (millions)		Per capita GDP ($, ppp, 98)		Literacy rates* (%, 95)	
1. Russia	146.39	1. Czech Republic	11,300	1. Russia (89 est.)	100.0
2. Poland	38.61	2. Hungary	7,400	2. Bulgaria (tie, 92 est)	99.0
3. Czech Republic	10.28	3. Poland	6,800	2. Hungary (tie, 80 est)	99.0
4. Hungary	10.19	4. Bulgaria	4,100	2. Poland (tie, 78 est)	99.0
5. Bulgaria	8.19	5. Russia	4,000	*. Czech Republic	N/A

Table 5: Basic indicator rankings for the developed world

Population (millions)		Per capita GDP ($, ppp, 98)		Literacy rates* (%, 95)	
1. USA	272.64	1. USA	31,500	*. Belgium	N/A
2. Japan	126.18	2. Belgium	23,400	*. Canada	N/A
3. Germany	82.09	3. Denmark	23,300	*. Denmark	N/A
4. France	59.98	4. Japan	23,100	*. France	N/A
5. UK	59.11	5. France	22,600	*. Germany	N/A
6. Italy	56.74	6. Canada	22,400	*. Ireland	N/A
7. Spain	39.17	7. Netherlands	22,200	*. Italy	N/A
8. Canada	31.00	8. Germany	22,100	*. Japan	N/A
9. Netherlands	15.81	9. UK	21,200	*. Netherlands	N/A
10. Belgium	10.18	10. Italy	20,800	*. Spain	N/A
11. Denmark	5.36	11. Ireland	18,600	*. UK	N/A
12. Ireland	3.63	12. Spain	16,500	*. USA	N/A

Source: CIA World Factbook, 1999

Note: Male literacy rates are used

Telecommunications Indicators

Table 6: Telecommunications infrastructure indicator rankings for Africa

Phone lines / 100 (98)		Phone line CAGR / 100 (95-98)		Largest city phone lines / 100 (96)		Cost of 1 hour local call ($, 99)		Faults / 100 lines (96)		Cellular subscribers / 100 (98)	
1. South Africa	11.46	1. Ghana	26.80	1. South Africa	41.52	1. Nigeria	0.40	1. Botswana	33.10	1. South Africa	5.64
2. Namibia	6.86	2. Botswana	17.40	2. Namibia	25.28	2. Botswana (tie)	0.60	2. Senegal	34.10	2. Botswana	1.46
3. Botswana	5.64	3. Senegal	16.40	3. Botswana	17.95	2. Zimbabwe (tie)	0.60	3. South Africa	72.30	3. Namibia	1.17
4. Zimbabwe	1.72	4. Mali	15.30	4. Kenya	7.84	4. Mozambique	0.80	4. Namibia	76.00	4. Cote d'Ivoire	0.64
5. Senegal	1.55	5. Zimbabwe	11.60	5. Zimbabwe	6.23	5. Ghana	1.34	5. Cote d'Ivoire	80.00	5. Zimbabwe	0.43
6. Cote d'Ivoire	1.19	6. Cote d'Ivoire	11.50	6. Senegal	3.74	6. Kenya	1.36	6. Mozambique	85.00	6. Senegal	0.25
7. Kenya	0.92	7. Uganda	11.10	7. Ethiopia	3.72	7. South Africa	1.60	7. Uganda	90.00	7. Uganda	0.15
8. Zambia	0.88	8. Namibia	10.70	8. Cote d'Ivoire	3.27	8. Senegal	1.93	8. Ghana	112.00	8. Ghana (tie)	0.12
9. Ghana	0.75	9. Tanzania	7.60	9. Uganda	3.09	9. Tanzania	1.94	9. Zambia	144.00	8. Zimbabwe (tie)	0.12
10. Mozambique	0.40	10. Kenya	4.70	10. Ghana	2.78	10. Zambia	2.50	10. Tanzania	175.00	10. Zambia	0.06
11. Tanzania	0.38	11. Mozambique	4.40	11. Mozambique (tie)	2.40	11. Ethiopia	2.60	11. Kenya	186.00	11. Mali (tie)	0.04
12. Nigeria	0.40	12. South Africa	4.30	11. Zambia (tie)	2.40	12. Mali	2.82	12. Zimbabwe	240.00	11. Mozambique (tie)	0.04
13. Ethiopia (tie)	0.28	13. Ethiopia	3.40	13. Tanzania	2.30	13. Uganda	8.40	*. Ethiopia	N/A	13. Kenya	0.02
13. Uganda (tie)	0.28	14. Nigeria	0.90	14. Mali	1.68	*. Cote d'Ivoire	N/A	*. Mali	N/A	14. Nigeria	0.01
15. Mali	0.25	15. Zambia	-2.30	15. Nigeria	1.31	*. Namibia	N/A	*. Nigeria	N/A	15. Ethiopia	0.00

Source: Mike Jensen

Table 7: Telecommunications infrastructure indicator rankings for Asia

Phone lines / 100 (98)		Phone line CAGR / 100 (95-98)		Largest city phone lines / 100 (96)		Cost of 1 hour local call ($, 96)		Faults / 100 lines (96)		Cellular subscribers / 100 (98)	
1. Singapore	56.20	1. Vietnam	34.90	1. Taiwan	65.68	1. India	0.40	1. Singapore	0.30	1. Singapore	34.60
2. Taiwan	52.44	2. China	28.20	2. Singapore	46.07	2. Singapore	0.60	2. Taiwan	11.50	2. Korea	30.19
3. Korea	43.27	3. Philippines	21.70	3. Korea	45.01	3. Korea (tie)	0.80	3. Korea	15.20	3. Taiwan	21.56
4. Malaysia	19.76	4. India	19.40	4. Thailand	33.13	3. Malaysia (tie)	0.80	4. Indonesia	18.60	4. Malaysia	9.92
5. Thailand	8.40	5. Indonesia	16.90	5. Malaysia	22.43	3. Taiwan (tie)	0.80	5. Thailand	45.00	5. Thailand	3.25
6. China	7.00	6. Thailand	12.50	6. China	18.97	6. Indonesia	1.00	6. Malaysia	60.00	6. Philippines	2.19
7. Philippines	3.70	7. Taiwan	6.80	7. Indonesia	18.52	7. Vietnam	2.20	7. Philippines	131.60	7. China	1.90
8. Indonesia	2.70	8. Malaysia	6.00	8. India	10.40	8. Thailand	2.40	8. India	206.40	8. Indonesia	0.52
9. Vietnam	2.58	9. Singapore	5.50	9. Philippines	9.16	*. China	N/A	*. China	N/A	9. Vietnam	0.24
10. India	2.20	10. Korea	1.60	10. Vietnam	8.96	*. Philippines	N/A	*. Vietnam	N/A	10. India	0.12

Source: International Telecommunications Union

Table 8: Telecommunications infrastructure indicator rankings for Latin America

Phone lines / 100 (98)		Phone line CAGR / 100 (95-98)		Largest city phone lines / 100 (96)		Cost of 1 hour local call ($, 96)		Faults / 100 lines (96)		Cellular subscribers / 100 (98)	
1. Uruguay	25.04	1. Bolivia	31.60	1. Uruguay	30.82	1. Colombia (tie)	0.20	1. Brazil	3.20	1. Venezuela	8.67
2. Chile	20.55	2. Paraguay	16.90	2. Venezuela	26.31	1. Ecuador (tie)	0.20	2. Venezuela	3.70	2. Argentina	7.81
3. Argentina	20.27	3. Colombia	16.30	3. Argentina	25.29	1. Peru (tie)	0.20	3. Mexico	4.60	3. Chile	6.50
4. Colombia	17.30	4. Chile	15.80	4. Colombia	25.07	1. Venezuela (tie)	0.20	4. Argentina	29.30	4. Uruguay	5.96
5. Costa Rica	17.20	5. Peru (tie)	12.30	5. Ecuador	19.37	5. Brazil	0.80	5. Peru	51.80	5. Colombia	4.91
6. Brazil	12.05	5. Brazil (tie)	12.30	6. Chile	18.15	6. Paraguay	1.20	6. Chile	63.00	6. Brazil	4.68
7. Venezuela	11.67	7. Ecuador	8.80	7. Brazil	16.47	7. Chile	1.80	7. Ecuador	65.00	7. Paraguay	4.12
8. Mexico	10.36	8. Uruguay	8.70	8. Paraguay	11.45	8. Argentina	2.00	8. Colombia	78.40	8. Mexico	3.50
9. Ecuador	7.80	9. Argentina	8.40	9. Peru	13.24	9. Uruguay	3.80	9. Uruguay	95.00	9. Peru	3.00
10. Bolivia	6.90	10. Costa Rica	6.10	10. Bolivia	9.56	*. Bolivia	N/A	*. Bolivia	N/A	10. Costa Rica	2.83
11. Peru	6.70	11. Mexico	3.30	*. Costa Rica	N/A	*. Costa Rica	N/A	*. Costa Rica	N/A	11. Bolivia	2.74
12. Paraguay	5.50	12. Venezuela	0.80	*. Mexico	N/A	*. Mexico	N/A	*. Paraguay	N/A	12. Ecuador	2.53

Table 9: Telecommunications infrastructure indicator rankings for Eastern Europe

Phone lines / 100 (98)		Phone line CAGR / 100 (95-98)		Largest city phone lines / 100 (96)		Cost of 1 hour local call ($, 96)		Faults / 100 lines (96)		Cellular subscribers / 100 (98)	
1. Czech Republic	36.39	1. Hungary	16.80	1. Czech Republic	52.12	1. Bulgaria	0.20	1. Bulgaria	27.30	1. Hungary	10.50
2. Hungary	33.59	2. Czech Republic	15.50	2. Russia	42.86	2. Poland	1.20	2. Hungary	39.50	2. Czech Republic	9.39
3. Bulgaria	32.90	3. Poland	15.30	3. Bulgaria	37.78	3. Czech Republic	1.40	3. Russia	41.90	3. Poland	4.98
4. Poland	22.76	4. Russia	5.20	4. Hungary	36.89	4. Hungary	3.00	4. Czech Republic	48.60	4. Bulgaria	1.52
5. Russia	19.70	5. Bulgaria	2.60	*. Poland	N/A	*. Russia	N/A	*. Poland	N/A	5. Russia	0.51

Source: International Telecommunications Union

Table 10: Telecommunications infrastructure indicator rankings for the developed world

Phone lines / 100 (98)		Phone line CAGR / 100 (95-98)		Largest city phone lines / 100 (96)		Cost of 1 hour local call ($, 96)		Faults / 100 lines (96)		Cellular subscribers / 100 (98)	
1. Denmark	65.97	1. Ireland	6.20	*. Belgium	N/A	1. Japan (tie)	1.80	1. Spain	1.30	1. Japan	37.44
2. USA (97)	64.37	2. Netherlands	4.20	*. Canada	N/A	1. USA (tie)	1.80	2. Japan	1.70	2. Denmark	36.44
3. Canada	63.39	3. UK	4.10	*. Denmark	N/A	3. Spain	2.00	3. Netherlands	2.20	3. Italy	35.53
4. Netherlands	59.31	4. Germany	3.40	*. France	N/A	4. France	2.80	4. USA	4.40	4. Ireland	25.70
5. France	56.97	5. USA	3.00	*. Germany	N/A	5. Germany	3.20	5. France	5.90	5. USA	25.60
6. Germany	56.68	6. Belgium	2.70	*. Ireland	N/A	6. Denmark	3.40	6. Belgium	7.40	6. UK	25.23
7. UK (97)	54.49	7. Denmark	2.50	*. Italy	N/A	7. Belgium (tie)	4.00	7. Germany	8.70	7. Netherlands	21.29
8. Belgium	50.02	8. Spain	2.40	*. Japan	N/A	7. Italy (tie)	4.00	8. Italy	12.60	8. France	18.78
9. Japan	46.31	9. Canada	1.60	*. Netherlands	N/A	*. Canada	N/A	9. UK	15.00	9. Spain	17.91
10. Italy	45.07	10. Italy	1.30	*. Spain	N/A	*. Ireland	N/A	*. Canada	N/A	10. Canada	17.56
11. Ireland	43.47	11. France	0.70	*. UK	N/A	*. Netherlands	N/A	*. Denmark	N/A	11. Belgium	17.24
12. Spain	41.37	12. Japan	-1.60	*. USA	N/A	*. UK	N/A	*. Ireland	N/A	12. Germany	16.97

Source: International Telecommunications Union

IT and Internet Infrastructure Indicators

Table 11: IT and Internet infrastructure indicator rankings for Africa

Internet hosts / 10,000 (99)		Internet hosts (99)		Internet users / 100 (99)		Internet users (99)		PCs / 100 (97)		ISPs (99)		IT spending as % of GDP (97)	
1. South Africa	32.34	1. South Africa	140,470	1. South Africa	2.92	1. South Africa	1,266,000	1. South Africa	4.16	1. South Africa	120	1. South Africa	2.50
2. Namibia	12.09	2. Namibia	1,995	2. Botwana	0.23	2. Kenya	15,000	2. Namibia	1.86	2. Zimbabwe	17	*. Botswana	N/A
3. Botswana	6.53	3. Zimbabwe	1,416	3. Namibia	0.18	3. Uganda	12,000	3. Botswana	1.34	3. Kenya	16	*. Cote d'Ivoire	N/A
4. Zimbabwe	1.27	4. Botswana	953	4. Zimbabwe	0.09	4. Zimbabwe	10,000	4. Senegal	1.14	4. Nigeria	15	*. Ethiopia	N/A
5. Zambia	0.49	5. Kenya	560	5. Kenya (tie)	0.05	5. Mozambique (tie)	5,000	5. Zimbabwe	0.90	5. Tanzania	14	*. Ghana	N/A
6. Senegal	0.26	6. Zambia	478	5. Uganda (tie)	0.05	5. Ghana (tie)	5,000	6. Nigeria	0.51	6. Ghana (tie)	9	*. Kenya	N/A
7. Cote d'Ivoire	0.23	7. Cote d'Ivoire	370	7. Ghana (tie)	0.03	7. Botswana	3,400	7. Cote d'Ivoire	0.33	6. Senegal (tie)	9	*. Mali	N/A
8. Kenya	0.19	8. Senegal	259	7. Mozambique (tie)	0.03	8. Nigeria (tie)	3,000	8. Kenya	0.23	8. Botswana (tie)	6	*. Mozambique	N/A
9. Mozambique	0.08	9. Tanzania	158	7. Zambia (tie)	0.03	8. Cote d'Ivoire (tie)	3,000	9. Ghana (tie)	0.16	8. Mozambique (tie)	6	*. Namibia	N/A
10. Ghana	0.06	10. Mozambique	156	10. Cote d'Ivoire (tie)	0.02	8. Zambia (tie)	3,000	9. Mozambique (tie)	0.16	8. Namibia (tie)	6	*. Nigeria	N/A
11. Tanzania (tie)	0.05	11. Uganda	125	10. Senegal (tie)	0.02	8. Namibia (tie)	3,000	9. Tanzania (tie)	0.16	11. Mali	5	*. Uganda	N/A
11. Uganda (tie)	0.05	12. Ghana	112	12. Mali (tie)	0.01	12. Ethiopia (tie)	2,500	12. Uganda	0.14	12. Ethiopia (tie)	4	*. Senegal	N/A
13. Ethiopia (tie)	0.01	13. Ethiopia	81	12. Tanzania (tie)	0.01	12. Tanzania (tie)	2,500	13. Mali	0.06	13. Uganda (tie)	4	*. Tanzania	N/A
13. Mali (tie)	0.01	14. Nigeria	58	14. Ethiopia (tie)	0.00	12. Senegal (tie)	2,500	*. Ethiopia	N/A	14. Cote d'Ivoire (tie)	3	*. Zambia	N/A
13. Nigeria (tie)	0.01	15. Mali	6	14. Nigeria (tie)	0.00	15. Mali	1,000	*. Zambia	N/A	14. Zambia (tie)	3	*. Zimbabwe	N/A

Table 12: IT and Internet infrastructure indicator rankings for Asia

Internet hosts / 10,000 (99)		Internet hosts (99)		Internet users / 100 (latest)		Internet users (latest)		PCs / 100 (98)		ISPs (98)		IT spending as % of GDP (97)	
1. Singapore	294.23	1. Taiwan	424,209	1. Taiwan	19.00	1. Taiwan	4,200,000	1. Singapore	45.84	1. China	200	1. Singapore	2.70
2. Taiwan	191.86	2. Korea	260,146	2. Singapore	14.16	2. China (tie)	4,000,000	2. Taiwan	15.86	2. Philippines	145	2. Malaysia (tie)	1.80
3. Korea	55.49	3. Singapore	103,862	3. Korea	8.53	2. Korea (tie)	4,000,000	3. Korea	15.68	3. India	72	2. Vietnam (tie)	1.80
4. Malaysia	25.00	4. China	62,935	4. Malaysia	2.81	4. India	800,000	4. Malaysia	5.86	4. Taiwan	60	4. Korea	1.70
5. Thailand	4.57	5. Malaysia	53,447	5. Philippines	0.40	5. Malaysia	600,000	5. Thailand	2.16	5. Indonesia	40	5. Taiwan	1.00
6. Philippines	1.25	6. Thailand	27,690	6. China	0.32	6. Singapore	500,000	6. Philippines	1.51	6. Korea	31	6. China (tie)	0.90
7. Indonesia	0.73	7. India	17,979	7. Thailand	0.22	7. Philippines	320,000	7. China (tie)	0.82	7. Singapore	3	6. Philippines (tie)	0.90
8. China	0.50	8. Indonesia	15,766	8. India	0.08	8. Thailand	131,000	7. Indonesia (tie)	0.82	8. Malaysia	2	8. Thailand	0.70
9. India	0.18	9. Philippines	9,942	9. Indonesia	0.04	9. Indonesia	80,000	9. Vietnam	0.46	*. Thailand	N/A	9. India	0.60
10. Vietnam	0.00	10. Vietnam	2	10. Vietnam	0.01	10. Vietnam	6,000	10. India	0.27	*. Vietnam	N/A	10. Indonesia	0.50

Table 13: IT and Internet infrastructure indicator rankings for Latin America

Internet hosts / 10,000 (99)		Internet hosts (99)		Internet users / 100 (latest)		Internet users (latest)		PCs / 100 (98)		ISPs (98)		IT spending as % of GDP (97)	
1. Uruguay	38.36	1. Brazil	310,138	1. Brazil	2.97	1. Brazil	5,100,000	1. Chile	4.82	1. Brazil	400	1. Brazil	1.30
2. Argentina	27.72	2. Mexico	224,239	2. Uruguay	2.72	2. Mexico	900,000	2. Mexico	4.70	2. Mexico	93	2. Chile	1.20
3. Mexico	22.36	3. Argentina	101,833	3. Chile	1.00	3. Colombia	350,000	3. Venezuela	4.30	3. Argentina	90	3. Colombia (tie)	1.10
4. Chile	21.52	4. Chile	32,208	4. Argentina	0.95	4. Argentina	348,000	4. Argentina	3.92	4. Chile	13	3. Mexico (tie)	1.10
5. Brazil	18.05	5. Colombia	31,183	5. Mexico	0.90	5. Chile	150,000	5. Colombia (97)	3.34	*. Bolivia	N/A	5. Argentina	0.80
6. Costa Rica	10.18	6. Uruguay	12,697	6. Colombia	0.89	6. Uruguay	90,000	6. Brazil	3.01	*. Colombia	N/A	6. Venezuela	0.70
7. Colombia	7.93	7. Venezuela	9,424	7. Costa Rica	0.82	7. Venezuela	80,000	7. Uruguay (97)	2.19	*. Costa Rica	N/A	*. Bolivia	N/A
8. Venezuela	4.06	8. Peru	7,805	8. Venezuela	0.34	8. Costa Rica	30,000	8. Ecuador (97)	1.30	*. Ecuador	N/A	*. Costa Rica	N/A
9. Peru	2.93	9. Costa Rica	3,736	9. Bolivia	0.10	9. Peru	20,000	9. Peru (97)	1.23	*. Paraguay	N/A	*. Ecuador	N/A
10. Paraguay	2.40	10. Ecuador	1,764	10. Peru	0.08	10. Bolivia	8,000	*. Bolivia	N/A	*. Peru	N/A	*. Paraguay	N/A
11. Ecuador	1.40	11. Paraguay	1,303	11. Ecuador	0.04	11. Ecuador	5,000	*. Costa Rica	N/A	*. Venezuela	N/A	*. Peru	N/A
12. Bolivia	0.48	12. Bolivia	386	12. Paraguay	0.02	12. Paraguay	1,000	*. Paraguay	N/A	*. Uruguay	N/A	*. Uruguay	N/A

Table 14: IT and Internet infrastructure indicator rankings for Eastern Europe

Internet hosts / 10,000 (99)		Internet hosts (99)		Internet users / 100 (latest)		Internet users (latest)		PCs / 100 (98)		ISPs (98)		IT spending as % of GDP (97)	
1. Hungary	92.01	1. Russia	172,515	1. Hungary	4.91	1. Russia	1,200,000	1. Czech Republic (97)	8.25	1. Czech Republic	350	1. Czech Republic	2.80
2. Czech Republic	85.58	2. Poland	158,099	2. Czech Republic	2.63	2. Poland	700,000	2. Hungary (97)	4.90	2. Poland	7	2. Hungary	1.70
3. Poland	40.95	3. Hungary	93,759	3. Poland	1.81	3. Hungary	500,000	3. Russia	4.06	*. Bulgaria	N/A	3. Poland	1.20
4. Bulgaria	11.93	4. Czech Republic	87,976	4. Russia	0.82	4. Czech Republic	270,000	4. Poland (97)	3.62	*. Hungary	N/A	4. Russia	0.70
5. Russia	11.78	5. Bulgaria	9,770	*. Bulgaria	N/A	*. Bulgaria	N/A	5. Bulgaria (97)	2.97	*. Russia	N/A	5. Bulgaria	0.40

Table 15: IT and Internet infrastructure indicator rankings for the developed world

Internet hosts / 10,000 (99)		Internet hosts (99)		Internet users / 100 (latest)		Internet users (latest)		PCs / 100 (98)		ISPs (98)		IT spending as % of GDP (97)	
1. USA	1219.59	1. USA	33,250,947	1. Canada	40.97	1. USA	106,300,000	1. USA	45.86	1. USA	4,354	1. USA	4.00
2. Denmark	535.96	2. Japan	2,072,529	2. USA	38.99	2. Japan	18,000,000	2. Denmark	37.74	2. Spain	798	2. UK	3.40
3. Canada	417.56	3. UK	1,599,497	3. Denmark	31.72	3. Canada	12,700,000	3. Canada	33.00	3. Canada	750	3. Canada	3.30
4. Netherlands	403.28	4. Germany	1,426,928	4. UK	21.15	4. UK	12,500,000	4. Netherlands	31.76	4. Italy	500	4. Denmark	2.50
5. UK	270.60	5. Canada	1,294,447	5. Netherlands	14.55	5. Germany	9,900,000	5. Germany	30.47	5. Japan	390	5. Netherlands	2.40
6. Belgium	268.04	6. France	653,686	6. Japan	14.27	6. France	6,200,000	6. Belgium	28.60	6. UK	384	6. France (tie)	2.10
7. Germany	173.82	7. Netherlands	637,591	7. Belgium	13.75	7. Italy	5,000,000	7. Ireland	27.17	7. France	250	6. Belgium (tie)	2.10
8. Japan	164.25	8. Italy	393,627	8. Ireland	12.23	8. Spain	3,107,000	8. UK	26.30	8. Belgium	141	8. Germany (tie)	1.80
9. Ireland	160.88	9. Spain	302,457	9. Germany	12.06	9. Netherlands	2,300,000	9. Japan	23.76	9. Netherlands	130	8. Japan (tie)	1.80
10. France	108.98	10. Denmark	287,273	10. France	10.34	10. Denmark	1,700,000	10. France	20.78	10. Germany	67	10. Ireland	1.70
11. Spain	77.22	11. Belgium	272,867	11. Italy	8.81	11. Belgium	1,400,000	11. Italy	17.34	11. Denmark	53	11. Italy	1.50
12. Italy	69.37	12. Ireland	58,399	12. Spain	7.93	12. Ireland	444,000	12. Spain	14.48	12. Ireland	20	12. Spain	1.20

Sources: International Telecommunications Union (PCs / 100, ISPs)
International Data Corporation (IT spending as % of GDP)
Internet Software Consortium (Internet hosts)
Nua.ie (Internet users)
Sangonet / Mike Jensen (Africa: Internet users, ISPs)
U.S. Department of Commerce (Internet hosts / 10,000, Internet users / 100)

Notes: U.S. Department of Commerce figures are derived from ISC and Nua.ie data.
Nua.ie data is compiled from latest sources on Internet usage worldwide. Reliability of sources may vary.